

colored perigynia, which are less inflated and much more spreading, standing at nearly right angles to the axis of the spike.—Lansing, Mich. A large clump of this Carex was found growing between clumps of *C. lurida* and *C. retrorsa*. Its habit and characters were such as to at once place its hybrid origin beyond a doubt. It also explains certain ambiguous specimens which have been sent me for name—I can not now recall from whom—and which I recollect to have referred to *C. lurida*. Without an intimate acquaintance with *C. lurida* this hybrid will not be readily recognized. It is very likely to be mistaken for *C. tentaculata*. It resembles very closely *C. tentaculata*  $\times$  *lurida* Bailey (*C. tentaculata* var. *altior* Boott). Infertile.

*Agricultural College, Mich.*

---

### The distribution of Isoetes.

LUCIEN M. UNDERWOOD.

The species of Isoetes have been neglected by collectors in many localities, so that our knowledge of their distribution is likely to be considerably modified by further discoveries. Forming, as they do, an inconspicuous element in aquatic vegetation and still more rarely seen in marshy places, they are easily passed by unless one is specially searching for them. Their resemblance to sterile aquatic sedges or *Juncus* increases the probability of their being overlooked. It may be of interest to note something of the distribution and history of our native species during the six years which have passed since the publication of Dr. Engelmann's valuable monograph<sup>1</sup>, as well as to note some of the remarkable features of their distribution on other continents. The species were classed by Engelmann as "submerged," "amphibious" and "terrestrial." Baker<sup>2</sup> makes four groups to which similar terms are differently applied, his group "Aquaticæ" including only a part of Engelmann's "submerged" species, his group "Subaquaticæ" including the remainder, together with Engelmann's "amphibious" species, his group "Am-

<sup>1</sup>The genus Isoetes in North America. In *Trans. St. Louis Academy of Science* iv, 358-390 (1882).

<sup>2</sup>Fern Allies, p. 124 (1887).

phibiæ" including Engelmann's "terrestrial" species, while his group "Terrestres" is limited to two European species whose leaf bases are persistent. Baker enumerates forty-nine species; with two of Dr. Engelmann's species overlooked by him and the two species described below the number is brought up to fifty-three.

Geographically *Isoetes* has a peculiarly wide distribution; to illustrate its main features we will take the various regions of the world in order, commencing with Europe, where the genus was first known:

I. EUROPE.—The European species are thirteen in number, only excelled by our own continent. The species are as follows:<sup>3</sup>

<i>I. lacustris</i> L. (1)	<i>I. Malinverniana</i> Ces. & DeNot. (3)
<i>I. echinospora</i> Dur. (1)	<i>I. velata</i> A. Br. (3)
<i>I. Azorica</i> Dur. (1)	<i>I. dubia</i> Gennari. (3)
<i>I. setacea</i> Bosc. (3)	<i>I. Tegulensis</i> Gennari. (3)
<i>I. tenuissima</i> Boreau. (3)	<i>I. hystrix</i> Bory. (4)
<i>I. Boryana</i> Dur. (3)	<i>I. Duriæi</i> Bory. (4)
<i>I. adspersa</i> A. Br. (3)	

Of the above, two species alone, *I. lacustris* and *I. echinospora*, are found in northern Europe, extending to the mountain regions of central Europe; both, moreover, are found with us. Three others, *I. hystrix*, *I. Duriæi*, *I. velata*, are widely distributed throughout the Mediterranean region from Spain and Algeria to Asia Minor, *I. Azorica* is confined to the Azores, *I. dubia* and *I. Tegulensis* to Sardinia and neighboring islands, *I. Malinverniana* to Piedmont, and the remaining species to France. In the minor distribution France leads with nine species, the island of Sardinia has five, while England and Sweden have only two each.<sup>4</sup>

II. AFRICA.—From Africa ten species have been reported:

<i>I. Peralderiana</i> Dur. & Let. (3)	<i>I. Natalensis</i> Baker. (3)
<i>I. velata</i> A. Br. (3)	<i>I. Welwitschii</i> A. Br. (3)
<i>I. adspersa</i> A. Br. (3)	<i>I. Schweinfurthii</i> A. Br. (3)
<i>I. hystrix</i> Bory. (4)	<i>I. æquinoctialis</i> Welw. (3)
<i>I. Duriæi</i> Bory. (4)	<i>I. nigritiana</i> A. Br. (3)

Of these, the first five are found only in Algeria, the first alone being peculiar to that country; the second is found

<sup>3</sup>The numbers following the species refer to Baker's groups in the order named above.

<sup>4</sup>*I. hystrix* is recorded from Guernsey, which is botanically a part of France, though politically of England.

also in France, and the remaining three belong to the Mediterranean region generally. The last five form the proper African flora, and are distributed from the Niger region to Natal. With such a wide distribution of the few known species it will be surprising if the interior of the Dark Continent does not yield a harvest of new forms.

III. ASIA.—From Asia we have the smallest number from any continent except South America, which has the same number—six. Of these, only three are peculiar to Asia. The species are :

*I. velata* A. Br. (3)  
*I. hystrix* Bory. (4)  
*I. Duriæi* Bory. (4)

*I. Olympica* A. Br. (3)  
*I. Japonica* A. Br. (3)  
*I. Coromandeliana* L. (3)

The first three have already been discussed as Mediterranean ; of the remainder, the first is from Asia Minor, the second from Japan, and the third from India ; illustrating again the wide distribution of the genus.

IV. AUSTRALASIA has eight species, as follows :

*I. Gunnii* A. Br. (1)  
*I. elatior* F. M. (1)  
*I. Sturtii* A. Br. (1)  
*I. Kirkii* A. Br. (2)

*I. alpina* Kirk. (2)  
*I. Muelleri* A. Br. (2)  
*I. Drummondii* A. Br. (2)  
*I. tripus* A. Br. (3)

Here again we have a singular example of wide distribution : the first three are from Tasmania, *I. Kirkii* and *I. alpina* are from New Zealand, *I. Muelleri* is from Queensland, and the last two are from West Australia.

V. SOUTH AMERICA.—From America south of the isthmus of Panama we have the six following species :

*I. triquetra* A. Br. (1)  
*I. Lechleri* Mett. (1)  
*I. Savatieri* Franchet. (3)

*I. Martii* A. Br. (3)  
*I. Amazonica* A. Br. (3)  
*I. Gardeneriana* Kze. (3)

Of these, the first two are from the high Andes of Peru, the third is from Patagonia, and the remainder are from Brazil.

VI. NORTH AMERICA.—Coming lastly to our own country, we find the largest representation of Isoetes anywhere found. Nineteen species occur within the limits of North America, including a single species from the West Indies. Of these, only the first two are found elsewhere. Omitting varieties, we have :

- I. lacustris* L. (1)
- I. echinospora* Dur. (1)
- I. pygmæa* Engelm. (1)
- I. Bolanderi* Engelm. (2)
- I. Tuckermani* A. Br. (2)
- I. saccharata* Engelm. (2)
- I. riparia* Engelm. (2)
- I. melanospora* Engelm. (2)
- I. Engelmanni* A. Br. (3)
- I. Howellii* Engelm. (3)

- I. nuda* Engelm. (3)
- I. flaccida* Shuttleworth. (3)
- I. Suksdorpii* Baker. (3)
- I. Cubana* Engelm. (3)
- I. Mexicana* n. sp. (3)
- I. melanopoda* J. Gay. (3)
- I. maritima* n. sp. (3)
- I. Butleri* Engelm. (3)
- I. Nuttallii* Engelm. (3)

The distribution of most of these species has been discussed by Dr. Engelmann, but as his paper may not be generally known a few details may be referred to here. Most of the above species have a comparatively narrow range. *I. Tuckermani*, *I. saccharata* and *I. riparia* are confined to the northeastern border; *I. pygmæa*, *I. maritima*, *I. Howellii*, *I. nuda*, *I. Nuttallii* and *I. Suksdorpii* inhabit the Pacific border only; while Georgia with *I. melanospora*, Florida with *I. flaccida*, Cuba with *I. Cubana*, and Mexico with *I. Mexicana*, each yields a single species. On the other hand, *I. Engelmanni* ranges from New England to the Mississippi valley, and *I. Butleri* and *I. melanopoda* inhabit the interior, the former ranging from Tennessee to the Indian Territory, and the latter from Illinois to Texas. As *I. lacustris* and *I. echinospora* doubtless range over most of the northern half of the continent, the latter extending even to Greenland, a wider distribution of a genus could scarcely be imagined. Turning to individual states, we find a remarkable paucity of species everywhere. The published state lists consulted give species rarely and in many instances add the significant "rare" or "local" to the species given. Of ten state and local floras examined at random from our numerous publications of that character, one, that of Missouri (*Tracy*), gives two species; three, Iowa (*Arthur*), Illinois (*Patterson*) and Ohio (*Beardslee*), give one each; while the other six, North Carolina (*Curtiss*), Minnesota (*Upham*), Michigan (*Wheeler and Smith*), Wisconsin (*Lapham*), Indiana (*Coulter and Barnes*) and Washington (*Ward*) do not record a single species. Massachusetts, however, has five species, Pennsylvania and New Jersey four each, and New York, California and Oregon three each.<sup>5</sup> Dr. Engelmann's first prophecy, that other species "are expected to be found when the attention of collectors is more earnestly directed to them," finds a double fulfillment in the efforts of two veteran collectors,

<sup>5</sup> Cf. Engelmann, *loc. cit.*, p. 376.

Pringle in Mexico, and Macoun in Vancouver Island. His second prophecy, that "some of the apparently local species will yet be found in a more extended area," depends largely on the activity of collectors in the field.

Some general conclusions may be drawn from the above notes on geographic distribution:

1. The genus *Isoetes* has a world-wide distribution, being represented not only on every continent, but in almost every part of every continent.

2. While the range of the genus is world-wide, the range of most of the species is remarkably narrow. Excepting the two boreal species, *I. lacustris* and *I. echinospora*, and the three Mediterranean species, *I. velata*, *I. hystrix* and *I. Duriae*, the remaining species are largely local, many being known from a single locality.

3. France for Europe and Massachusetts for America present the largest number of species and varieties, owing, doubtless, to the fact that their collectors have been more active and watchful for these inconspicuous plants.

4. No center of distribution seems apparent; we are unable to assign headquarters for the genus.

5. As we approach tropical regions from both north and south we find a decrease of aquatic and subaquatic forms and a corresponding growth of amphibious, pseudo-terrestrial and terrestrial forms.<sup>6</sup>

6. Probabilities derived from a study of distribution point not only toward a much wider range for individual species, but also to the discovery of many more species as collectors turn their attention to them.

7. As is true of numerous other aquatic plants, water-fowl have doubtless been responsible for the wide distribution of certain species, notably *I. lacustris* and *I. echinospora*, which, no doubt, encircle the northern hemisphere.

We add the descriptions of two new species:

***Isoetes Mexicana.*** Amphibious: rootstock two-lobed: leaves 20-30, bright green, 12-22 cm. long; stomata numerous: sporangia oval, 5 mm. long, 3 mm. wide, delicate, unspotted; velum very narrow, almost wanting: ligule triangular, two-thirds as long as the sporangium: macrospores chalky-white, 0.25-0.375 mm. thick, nearly smooth, the three converging ridges in strong relief: microspores slate-colored, 0.028-0.033 mm. thick, mostly smooth.

<sup>6</sup> It should be noted that the two apparent exceptions to this law, *I. triquetra* and *I. Lechleri*, though found in equatorial regions, are both high mountain forms.

Slow streams, base of Sierra Madre, state of Chihuahua, Mexico, October, 1887 (*C. G. Pringle*, no. 1447).

This species is the first that has yet appeared within the limits of Mexico. Mr. Pringle writes: "The *Isoetes* was found in several different stations, in the shallows of slow rills of the sandy plains about the continental divide, at an elevation of 6,000 to 7,000 feet, and growing as well in the wet sand as in the bottom of pools. Its leaves—what the specimens scarcely show since they were dried—were sinuous and channeled above."

***Isoetes maritima.*** Amphibious or mostly terrestrial: root-stock small, only slightly bilobed: leaves 8–15, rigid, green, 2–5 cm. long, 1.5 mm. wide with abundant stomata: sporangia oval 4 mm. long, 2.5 mm. wide, brownish-white, covered one-third to one-half by the velum: ligule small, inconspicuous: macrospores 0.42–0.48 mm. thick, densely spinulose, the spines somewhat blunt, but rarely confluent: microspores white, smooth, 0.032–0.035 mm. thick.

Salt marsh, Alberni, Vancouver Island, August, 1887 (*J. Macoun*).<sup>7</sup>

This species, next to *I. pygmæa*, is the smallest of our flora; it differs from all our other pseudo-terrestrial species except *I. Nuttallii* in being monoœcious as well as by other marked characters; from *I. Nuttallii* it differs by its size, its partial velum and the sculpture of its spores.

Syracuse, N. Y.

### BRIEFER ARTICLES.

**Lichens from the Easter Islands.**—During the year 1885 the United States steamer "Mohican," commanded by Lt. B. F. Day, stopped for some time at these isolated islands for the purpose of procuring some of the famous stone idols which were left by the aborigines. Several fine examples were obtained, and are now on exhibition in the United States National Museum. When these images arrived they were thickly covered with a growth of lichens and a single species of moss. Mr. Henry Willey kindly determined the lichens as closely as their fragmentary condition would permit, finding *Usnea barbata* (L.) Fr., *Physcia stellaris* L., and a sterile *Parmelia* nearest to *Parmelia laevigata* (Sm.) Nyl. The

<sup>7</sup> With this species Prof. Macoun sends from his collection in Vancouver Island *I. Nuttallii*, extending the range of that species northward from Oregon, and two forms which I have referred provisionally to *I. echinospora*, though both differ somewhat from any described form of that species. The habits of the two were different, one coming from fresh water (Sproat Lake) and the other "between tides, in flowing water."